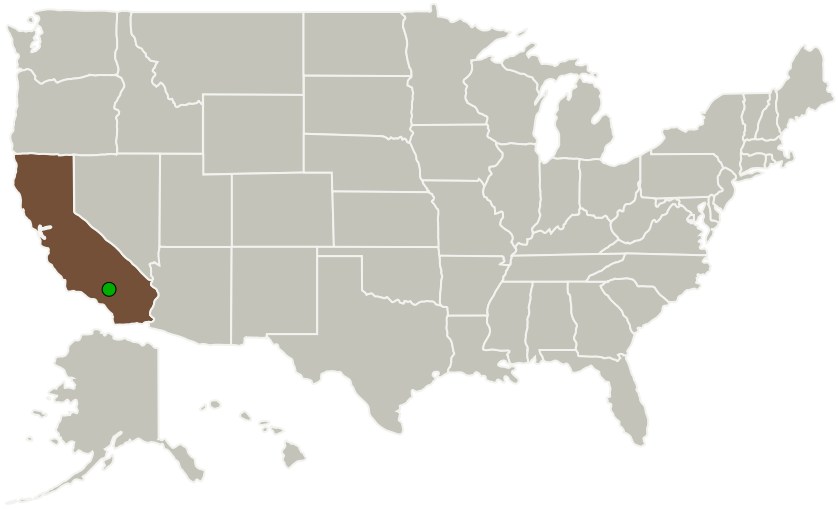
Versatile Sensor for Transition, Separation, and Shock Detection, Phase I

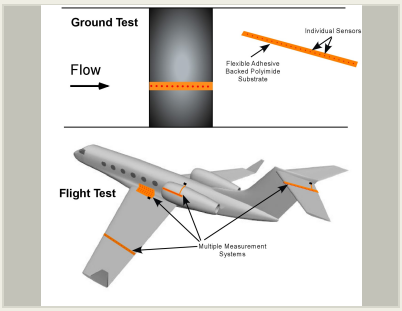
Completed Technology Project (2014 - 2014)

Project Introduction

The proposed innovation is a simple, robust, sensor array for the detection of laminar/turbulent transition location, areas of flowfield separation, and shock wave locations. The system can be used in both ground and flight test facilities. The proposed system uses a very robust and proven sensor technology combined with a novel mounting and manufacturing technique. The sensor array is reusable and can be produced in a configuration that requires no external power, acquisition or viewing, for flight test applications. The system combines an array of small, surface flush, sensors embedded in an extremely thin, flexible polyimide strip. The system operates by sensing changes in local heat transfer within the boundary-layer. Variations in heat transfer coefficients due to the state of the boundary layer (laminar, transitional, turbulent, separated regions) produce changes in the sensor output. Other flowfield features where heat transfer is affected will also be discernable, such as shock waves. The flush mounted sensors, embedded in a smooth, thin polyimide sheet, conform to the local surface contour and produce minimal aerodynamic interference, allowing non-intrusive measurements. The system will be quantitatively accurate across the low-speed through supersonic flow regime. After testing, the system can be quickly removed and reused. Compared to current systems designed for similar measurements, the proposed system promises to provide a significantly more robust and efficient system in a relatively simple, cost effective package.

Primary U.S. Work Locations and Key Partners





Versatile Sensor for Transition, Separation, and Shock Detection Project Image

Table of Contents

Versatile Sensor for Transition, Separation, and Shock Detection, Phase I

Completed Technology Project (2014 - 2014)

Organizations Performing Work	Role	Type	Location
Rolling Hills Research Corporation	Lead Organization	Industry	El Segundo, California
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations
California

Project Transitions

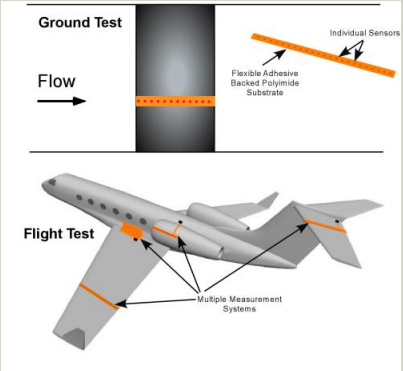
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140516)*

Images



Project Image
Versatile Sensor for Transition, Separation, and Shock Detection Project Image *(https://techport.nasa.gov/image/137029)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Rolling Hills Research Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Michael Kerho

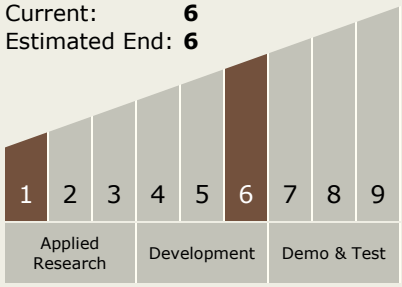
Co-Investigator:
Michael Kerho

Versatile Sensor for Transition, Separation, and Shock Detection, Phase I

Completed Technology Project (2014 - 2014)

Technology Maturity (TRL)

Start: **1**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.2 Heat Transport

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System